



Effectiveness of Some Nitrogen Dose and Cellulolytic Microorganism (MOS) toward Decomposition Rate of Tan and Empty Aerobic Palm

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Abstract

This study aims to determine the effect of nitrogen levels, cellulolytic microorganisms and the interaction of both the aerobic decomposition rate of oil palm empty fruit bunches. The research was conducted at Home Compost STIP-AP Medan in April until July 2016. Research used a factorial randomized block design consisting of two factors and three replications. The first factor is the dose of nitrogen consisting of four levels i.e. N0 = without urea, N1 = dose of Nitrogen 2% of the dry weight of TKS which is 40% as much as 48 grams, N2 = dose of Nitrogen 4% of the dry weight of TKS which is 40% as much as 96 grams, N3 = Nitrogen dose of 6% of the dry weight of TKS which is 40% as much as 144 grams. The second factor is the cellulolytic microorganism isolates comprising four levels i.e. M0 = without cellulolytic microorganisms isolates, with isolates MOS M1 = 10 ml, M2 = isolate MOS 20 ml, isolate MOS M3 = 30 ml. From the research the effectiveness of multiple doses of nitrogen and cellulolytic microorganisms (MOS) on the rate of decomposition of oil palm empty fruit bunches can be deduced as follows, namely addition of nitrogen dose was able to reduce levels of C/N was 76.4% of the levels of C/N beginning. The best treatment is contained in N3 treatment. Addition of Microorganisms treatment cellulolytic (MOS) is able to reduce levels of C/N as much as 74.6% of the levels of C/N beginning. The best treatment is contained in M3 treatment. Interaction between giving treatment cellulolytic microorganisms Nitrogen and reducing levels of C/N as much as 79.4%. Interaction best treatment there in treatment N3M3.

Keywords: nitrogen, MOS, oil palm of empty bunches

A. Introduction

The solid waste generated by the mill is available in large quantities throughout the year. The availability of oil palm empty fruit bunches almost equivalent to crude palm oil produced. Utilization of solid waste which is currently implemented TKS is used as mulch and nutrient sources in a manner stocked around the plant on the palm plantations (Darmosarkoro &

Rahutomo, 2000). How to use is not always applicable, especially in hilly plantation areas, which are located a hill or away from the plant caused by the cost of distribution to be expensive.

In principle composting oil palm empty fruit bunches (TKS) to lower the C / N ratio contained in bunches in order to approach the C / N ratio of land. C / N ratio is approaching the C / N ratio of land to be easily absorbed by plants (Fauzi et al., 2008)

TKS decomposition process that is scattered in the planting area is naturally slow that take between 6-12 months. Attempts to accelerate the decomposition can be done through physical, chemical and biological. Biological treatment is generally performed by adding the inoculums decomposers those cellulolytic microorganisms and multiple doses of Urea. MOS is a micro-organism that is capable of overhauling celluloses, hemicelluloses and lignin so that it can accelerate the decomposition process.

Research that has been done by using isolated microorganisms Wahyuni (2004) and Tariq (2011). TKS decompose aerobically with cellulolytic microorganisms as well as amendments to the chicken manure, cow and wastewater PKS, the conclusion is the provision of chicken manure amendment very significant effect on a decrease in C / N ratio. Giving cow dung very significant effect on a decrease in C / N ratio. Tariq (2011) decompose TK with the addition of cellulolytic microorganisms and EM manure. The provision of cellulolytic microorganism significant effect on decreasing C / N compost. The result of C / N value is best obtained from the interaction of both treatment.

Special purpose in this study to determine the effect of nitrogen (urea), MOS and the interaction of both the aerobic decomposition rate of TKS. The contribution of this study are expected to be useful for business people in the use of solid waste plantation palm oil mills in the form of empty fruit bunches to be processed into compost which can minimize the cost of fertilizer and expected to be input in the processing of solid waste TKS.

B. Methodology

The research was conducted at Home Compost land STIP-AP Medan Practices conducted in April-July, 2016.

This study uses a completely randomized factorial design with 2 treatments and 3 replications. Treatment 1 was dose Nitrogen (Urea) consists of 4 levels: N0: Control, N1: 2% of the dry weight of TKS, N2: 4% of the dry weight of TKS, N3: 6% of the dry weight of TKS. Treatment 2 is Microorganisms cellulosic (MOS) consists of 4 levels: Mo: Control, M1: 10 ml, M2: 20 ml, M3: 30 ml.

C. Findings and Discussion

1. Daily temperature

The temperature of the organic material TKS for all treatments achieved at the start composting is between 350C to 400C, this temperature is achieved due to the TKS organic material used is still fresh visible from the steam coming out of the EFB. In the first week the temperature composting of compostable material increased to 450C - 500C. Entering the second week the temperature dropped to the initial temperature of the composting ranged 400C. Then in the third week the temperature fell back to near room temperature composting. Constant temperature begins composting at room temperature according to the fourth week until the end of the composting.

2. Nutrient levels C of organic compost TKS

Nutrient content C of organic compost palm bunches were observed at the end of the study can be seen in Table 1 below:

Table 1. Average levels of C of organic compost TKS

Treatment	N0	N1	N2	N3	Total	Mean
	Control	48 gr	96 gr	144 gr		
M0 Control	30,38	21,33	20,34	20,77	92,82	23,20
	EFG	A	A	A		
M1 10 ml	27,74	22,97	19,17	22,04	91,91	22,98
	DEF	AB	A	A		
M2 20 ml	24,81	21,68	23,00	20,10	89,59	22,40
	ABCD	A	ABC	A		
M3 30 ml	26,47	19,43	21,97	18,42	86,29	21,57
	BCDE	A	A	A		
Total	109,39	85,41	84,48	81,33		

Mean	27,35	21,35 A	21,12 A	20,33 A
	B			

Description: Figures followed by the same letter (A, B) in the same column are not significantly different at $\alpha = 1\%$ by BNT test.

Value of organic C empty oil palm bunches before compostability are 44,3 %.

According to Table 1 for granting MOS can be seen that the organic C content was lowest for the treatment of M3 is 21.57 and the highest in the treatment M0 is 23.20. M3 nutrient content of organic C is lower than the 7.02% M0. When compared with the initial organic C content TKS (fresh TKS 44.3%), the decline in nutrient content of organic C by 51.3%. The response is in line with the results of the observations made by Tariq (2011). Tariq's In the study, addition of MOS treatment resulted in decreased levels of organic compost C for 40-50% of the initial content of organic C.

Effect of N (nitrogen) in the process of composting organic C- namely TKS against impairment C-organic. The C-lowest for the treatment of organic N3 is 20.33 and the highest in treatment N0 is 27.35. Levels of C-organic N3 25.66% lower than the N0. If compared with the initial levels of C-organic TKS then decreased levels of 54.1% of C-organic.

Interaction between N and M showed decreased levels of C-organic, lowest for the treatment N3M3 is 18.42 and the highest in N0M0 treatment is 30.38. N3M3 nutrient content of organic C lower than N0M0 39.36%, while on the nutrient content of organic C N3M3 early treatment can lower nutrient content of organic C as much as 58.41%. This occurs because the microorganisms contained in the compost are growing due to the availability of nutrients for microorganisms that are effective in lowering the value of C-organic oil palm empty fruit bunches.

3. N Nutrient levels of TKS Compost

Levels of N compostable palm bunch were observed at the end of the study can be seen in table 2 below:

Table 2. Average levels of N of compost TKS

Treatment	N0	N1	N2	N3	Total	Mean
	Control	48 g	96 g	144 g		
M0 Control	1,57	1,74	1,68	1,69	6,68	1,67
M1 10 ml	1,66	1,66	1,71	1,74	6,77	1,69
M2 20 ml	1,70	1,71	1,72	1,76	6,89	1,72
M3 30 ml	1,69	1,72	1,66	1,74	6,82	1,70
Total	6,62	6,84	6,77	6,93		
Mean	1,65	1,71	1,69	1,73		

Description: The annotated figures do not show unreal the influence.

Based on table 4.2 above can be seen that the value of N compost TKS levels showed no real results. Effect of M (MOS) at the highest levels of N compost at treatment M2 is 1.72 and the lowest in the treatment M0 is 1.67. M2 treatment nutrient content higher than 2.92% M0. When compared with the initial N content TKS (0.7%), the levels increase by 59.3% N compost. The response is in line with the results of the observations made by Tariq (2011). In addition to Tariq's research MOS produce compost treatment with the highest N content of 1.77%.

Effect of treatment of N (nitrogen) to the value of N compost TKS levels highest in N3 treatment is 1.73 and the lowest for the treatment of N0 is 1.65. N3treatment nutrient content is higher by 4.6% than N0. When compared with the initial N content TKS then caused a significant increase of 59.5% of N compost.

Interaction treatment of N and M that shows the highest levels of N compost at treatment N3M2 is 1.76 and the lowest in treatment N0M0 is 1.57. Levels of N compost N3M2 10.79% higher than the N0M0. When compared with the levels of N early then caused a significant increase of 60.22% of N compost.

4. Analysis of C/N Compost TKS

Analysis C / N compost carried out in the research that after 60 days of composting. From the analysis of variance showed that M (cellulolytic microorganism) has significant effect, treatment of N (nitrogen) was highly significant, and interaction of N and M very significant effect on the maturity of compost. Mean analysis of C / N compost with nitrogen treatment and MOS can be seen in Table 3:

Table 3. Average C / N compost treatment TKS Nitrogen (N) and Microorganism cellulolytic (MOS) after 60 days of composting

Treatment	N0	N1	N2	N3	Total	Mean
	Control	48 gr	96 gr	144 gr		
M0 Control	24,15	15,72	14,86	17,02	71,76	18,02
	EFG	A	A	A	A	b
M1 10 ml	21,64	19,97	15,76	14,72	72,08	17,94
	CDEF	ABCDE	A	A	A	a
M2 20 ml	19,45	14,82	16,75	14,87	65,90	16,47
	ABCD	A	A	A	A	a
M3 30 ml	18,540	14,64	17,97	13,17	64,32	16,08
	ABC	A	AB	A	A	a
Total	83,79	65,16	65,35	59,78		
Mean	20,95 B	16,29 A	16,34 A	14,94 A		

Description: Figures followed by the same letters (a, b), (A, B) in the same column are not significantly different at $\alpha = 5\%$, $\alpha = 1\%$ by BNT test.

The C-organic oil palm empty fruit bunches before compostability are 44.3% and a nitrogenous nutrient content of 0.7% by the C/N ratio is 63.4.

According to Table 3 for the provision of M can be seen that the C/N ratio was lowest for the treatment of M3 is 16.08 and the highest in the treatment M0 i.e. 18.02. C/N ratio M3 is lower than the 10.76% M0. When compared with the C / N early TKS (fresh TKS 63.4) then there is a decrease of C/N of 74.6%.

Effect of N (nitrogen) in the composting process TKS against C/N ratio value C/N was lowest for the treatment of N3 is 14.94 and the highest in treatment N0 is 20.95. C/N ratio N3 28.68% lower than the N0. If compared with the C/N early TKS then decreased C/N 76.4%. Interaction between N and M which shows a decrease in C/N was lowest for the treatment N3M3 is 13.17 and the highest in N0M0 treatment is 24.15. C/N ratio N3M3 lower than N0M0 45.46%, while the C/N N3M3 early treatment can lower C/N as much as 79.2%. If seen from the results of this study the effect of treatment N and M already decreasing C/N excellent compost. The response is in line with the results of the observations made by Wahyuni (2004), in the study produce compost with high levels of C/N value lows ranged from 9.8 to 14.4.

D. Conclusion

1. The addition of nitrogen can lower levels of C/N was 76.4% of the levels of C/N beginning. The best treatment is contained in N3 treatment.
2. Provision of Microorganisms cellulolytic (MOS) is able to reduce levels of C/N as much as 74.6% of the levels of C/N beginning. The best treatment is contained in M3 treatment.
3. The interaction between the administration of Nitrogen and cellulolytic microorganisms able to reduce levels of C/N as much as 79.4%. Interaction best treatment there in treatment N3M3.

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